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RESEARCH ARTICLE.........

Effect of supplementation of bypass fat on biochemical profile in dairy cows

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ABSTRACT...... The present investigation was undertaken with the objective to evaluate the effect of supplementation of bypass fat on biochemical profile in dairy cows. Total 12 healthy advanced pregnant cows (10 days before expected parturition) were selected and divided randomly into two equal groups. One group (Group I) of 6 cows was kept without supplementation of bypass fat and given only basal diet as a control group. The second group (Group II) of 6 cows was supplemented with rumen bypass fat (Extra Energy Plus) @ 100 g per animal per day along with basal diet for the period of 4 weeks after parturition. Blood biochemical parameters such as plasma glucose, serum cholesterol, serum triglyceride, serum calcium and serum phosphorus were estimated in all the animals before supplementation ('0' day) and on 7th, 14th, 21st and 30th day after supplementation. The supplementation of rumen bypass fat (Group II), maintained the levels of plasma glucose, serum cholesterol, serum triglyceride, serum calcium and serum phosphorus within normal range, whereas, in non supplemented group (Group I), plasma glucose and serum phosphorus levels decreased and serum triglyceride level increased significantly. The present study concluded that supplementation of rumen bypass fat proved beneficial in fulfilling the energy demand for production and prevented the cows entering into negative energy balance during early mid-lactation.

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KEY WORDS...... Advanced pregnant cows, Lactation, Bypass fat, Biochemical parameters

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INTRODUCTION...

During the early post partum period, milk production increases dramatically, while energy intake may not be adequate to sustain the higher production level. This results in negative energy balance and cows metabolize fat to meet their energy needs (Barley and Baghel, 2009). As a result, most of the cows loss a considerable amount of weight to meet energy demand.

The cereal grains and fat plays an important role as source of energy in the ration of high yielding dairy animals for optimum productivity but feeding of high levels of grains may lead to detrimental effect such as acidosis and laminitis. Therefore, the alternative source of energy in dairy ration is supplementation of fat (Saijpaul *et al.,*

2010). However, fat cannot be incorporated in the diet of animals more than 3-5 per cent, as it may cause deleterious effects upon the ruminal ecosystem as a result depress the fibre digestion. However, by protecting the fats from ruminal degradation, it is possible to increase fat content of the ration up to 6-7 per cent of the DM intake, so that the fats get digested and absorbed optimally in the lower tract for milk and fat production without affecting digestibility of DM and fibre. Rumen bypass fat supplementation increases energy density of ration, thus supplied more energy for milk synthesis, resulting in overall improvement in productivity and health of the animal. Thus, supplementation of bypass fat in ration to the high producing dairy animals is very crucial for enhancing the energy density of ration and better option for better health and productivity.

In view of the above facts the present study was undertaken to investigate the effect of rumen bypass fat on some biochemical profile in dairy cows.

RESEARCH METHODS....................................

In the present study, total 12 healthy advanced pregnant cows (10 days before expected parturition) were selected from Livestock Instructional Farm of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola and divided randomly into two equal groups. One group (Group I) of 6 advance pregnant cows was kept without supplementation of bypass fat as a normal control group and given only basal diet, 10 days before and upto 4 weeks after parturition . The second group (Group II) of 6 advance pregnant cows was supplemented with rumen bypass fat (“Extra Energy Plus” – each kg containing - Pure bypass fat - 200 g, Fermented live yeast culture-50 g, Calcium propionate- 10 g and Chromium chelated with Amino Acid- 40 g) @ 100 g per animal per day along with basal diet, 10 days before and up to 4 weeks after parturition.

Blood biochemical parameters such as plasma glucose, serum cholesterol, serum triglyceride, serum calcium and serum phosphorus were estimated by using reagent kit (Span Diagnostic Ltd.) on auto-analyzer (Model Span Autochem-2011) in all the animals under experiment before supplementation (‘0’ day) and on 7th, 14th, 21st and 30th day after supplementation during lactating stage. The data collected during the present study was analyzed statistically by using two ways Factorial Randomized Block Design (FRBD) as described by Snedecor and Cochran (1994).

RESEARCH FINDINGS AND ANALYSIS..........

The mean values of biochemical profile in Group I and Group II of advanced pregnant cows on day ‘0’ (before supplementation) and on 7th, 14th, 21st and 30th day after supplementation during lactation are presented in Table 1.

The statistical analysis revealed significant variation ($P<0.05$) in plasma glucose level between groups, indicated that plasma glucose level was significantly higher in Group II as compared with Group I (Control group). Thus, supplementation of bypass fat improved plasma glucose concentration and maintained the level within normal range in Group II. However, in control group (Group I), plasma glucose concentration significantly declined on 14th, 21st and 30th day post supplementation over the pre-supplemented level, indicated that these animals might have entered into negative energy balance due to drain of energy for milk production exceeds the energy uptake from the ingested normal basal diet during lactation. These observations are in agreement with previous reports, indicating that plasma glucose concentration was increased by supplementation of bypass fat in dairy cows (Juchema, 2008 and Zhang *et al.*, 2011). It could be attributed to the supplementation of bypass fat which might have provided the precursors for gluconeogenesis as the supplement contains calcium propionate and chromium which serves as a gluconeogenic precursor, thereby maintaining plasma glucose concentration (Goff *et al.*, 1996 and Zhang *et al.*, 2011). Another possible reason could be the glycolysis of sugar which might have inhibited by supplementation of bypass fat in order to improve their energy levels (Goff *et al.*, 1996; Mc Namara and Valdez, 2005 and Zhang *et al.*, 2011).

The statistical analysis revealed significant variation ($P<0.05$) in cholesterol level between groups. The critical differences and mean comparison indicated significant rise in serum cholesterol level after supplementation in Group II as compared to Group I kept without supplementation of bypass fat. The increase in serum cholesterol level after supplementation of bypass fat were also reported by Ranjan *et al.* (2010); Tyagi *et al.* (2010) and Zhang *et al.* (2011). Cholesterol is a component of the serum lipoproteins and its concentrations in serum

gives an indication of overall lipoprotein concentrations *i.e.* low density lipoprotein (LDL) or high density lipoprotein (HDL). Therefore, total cholesterol levels might have reflected on the metabolism of lipids, which can release more energy to decrease duration and magnitude of negative status in bypass fat supplemented animals.

The statistical analysis revealed non-significant variation ($P<0.05$) in serum triglyceride level, between groups. The Group II supplemented with bypass fat showed non-significant variation in serum triglyceride levels during different intervals, whereas, the Group I kept without supplementation of bypass fat showed significant ($P<0.05$) increase in serum triglyceride level on 21st and 30th day after supplementation as compared to pre-supplemented level ('0' day). Increased concentration of triglyceride indicates lipolysis, which occurs in response to increased energy demand (Garg *et al.*, 2012).

These findings indicated that animal kept without supplementation of bypass fat experienced negative energy balance during early mid lactation as evident by increase in serum triglyceride level in Group I as compared to supplemental group. Thus, supplementation of bypass fat 10 days before expected parturition helped to maintain the serum triglyceride level within the normal range and prevent the animals turning towards negative energy balance during the post parturient period. The findings of the present investigation are contradictory with the findings of Barley and Baghel (2009); Zhang *et al.* (2011) and Wadhwa *et al.* (2012), who observed increase in serum triglyceride level after supplementation of bypass fat as compared to control animals.

The statistical analysis revealed non-significant variation in serum calcium level between groups, indicated that bypass fat supplementation did not have any significant impact on serum calcium level during lactation in cows. Similar findings were also reported in crossbred cows by Wadhwa *et al.* (2012).

The statistical analysis revealed significant variation in serum phosphorus level ($P<0.05$) between Group I and Group II, indicated that serum phosphorus level was significantly higher in Group II, supplemented with bypass fat as compared to Group I (control group) without supplementation of bypass fat in cows during early mid lactation. However, Wadhwa *et al.* (2012) reported non-significant variation in serum phosphorus level after supplementation of bypass fat during lactation stage in crossbred cows.

Conclusion :

On the basis of overall observations, the present study indicated that there was no adverse effect of bypass fat supplementation on advanced pregnant and lactating cows. The supplementation of rumen bypass fat @ 100 g per cow per day along with basal diet, 10 days before expected parturition upto 4 weeks after parturition maintained the level of plasma glucose, serum cholesterol, serum triglyceride and serum phosphorus as compared to non-supplemented group (control group). The supplementation of rumen bypass fat increased energy density of ration and proved to be beneficial in fulfilling the energy demand for production and prevented the cows entering into negative energy balance during early

Table 1 : Mean values of blood biochemical parameters before ('0' day) and at different intervals after supplementation in group I and group II

Parameter	Groups	Intervals					Pooled mean
		0th Day	7th day	14th day	21st day	30th day	
Plasma glucose	Group I	$56.68^{d} \pm 0.41$	$55.67^{cd} \pm 0.58$	$54.37^{ce} \pm 0.75$	$52.38^{b} \pm 0.63$	$49.95^{a} \pm 0.39$	$53.81^{p} \pm 0.51$
(mg/dl)	Group II	$55.07^{de} \pm 1.97$	$55.23^{cde} \pm 1.28$	$55.25^{e} \pm 0.88$	$56.05^{e} \pm 0.32$	$56.53^{e} \pm 0.93$	$55.63^{q} \pm 0.54$
Serum cholesterol	Group I	$138.00^{ac} \pm 1.11$	$138.65^{a} \pm 1.07$	$139.92^{a} \pm 0.95$	$143.20^{b} \pm 0.53$	$145.32^{b} \pm 0.82$	$141.02^{p} \pm 1.35$
(mg/dl)	Group II	$139.93^{c} \pm 0.83$	$148.50^{d} \pm 1.51$	$150.28^{de} \pm 1.603$	$152.42^{e} \pm 1.39$	$156.58^{f} \pm 1.35$	$149.54^{q} \pm 1.17$
Serum triglyceride	Group I	$27.42^{ac} \pm 2.17$	$29.72^{ac} \pm 1.05$	$30.43^{ac} \pm 1.94$	$36.68^{b} \pm 2.10$	$37.93^{b} \pm 2.68$	32.44 ±1.15
(mg/dl)	Group II	$31.07^{c} \pm 3.41$	$30.18^{c} \pm 3.04$	$30.08^{c} \pm 2.77$	$29.97^{c} \pm 2.26$	$28.45^{c} \pm 2.16$	29.95 ±1.16
Serum calcium	Group I	8.12 ±0.11	8.25 ±0.10	8.28 ±0.16	8.47 ±0.17	8.50 ±0.15	8.32 ±0.06
(mg/dl)	Group II	8.10 ±0.57	8.20 ±0.21	8.37 ±0.29	8.48 ±0.27	8.52 ±0.17	8.33 ±0.14
Serum phosphorus	Group I	$4.85^{cd} \pm 0.11$	$4.67^{bc} \pm 0.11$	$4.57^{ab} \pm 0.11$	$4.50^{ab} \pm 0.09$	$4.38^{a} \pm 0.06$	$4.59^{p} \pm 0.05$
(mg/dl)	Group II	$4.95^{d} \pm 0.09$	$5.07^{de} \pm 0.18$	$5.20^{ef} \pm 0.08$	$5.45^{fg} \pm 0.09$	$5.55^{g} \pm 0.08$	$5.24^{q} \pm 0.06$

Similar superscript indicates non-significant variation within each parameter

mid-lactation.

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